

# CubeSat Ambipolar Thruster for LEO and Deep Space Missions, Phase I

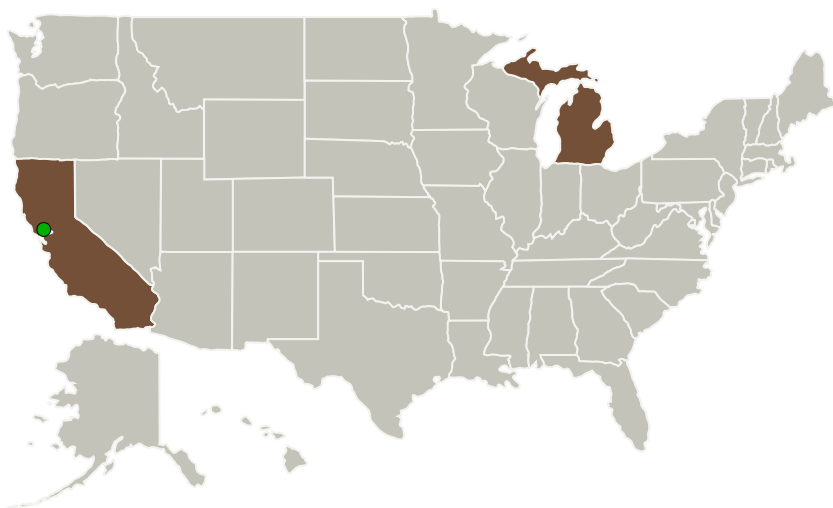
Completed Technology Project (2014 - 2014)



## Project Introduction

Aether Industries proposes the development of a novel, primary plasma propulsion system that is well suited for small spacecraft. This technology, called the CubeSat Ambipolar Thruster (CAT), would provide CubeSats and other micro- and nano-satellites with the propulsive capability to make meaningful orbital plane and altitude changes — capability that does not currently exist with state-of-the-art micropropulsion technologies. As such, the CAT engine is an enabling technology that supports NASA, commercial, university, and military CubeSat needs from constellation deployment to lunar orbit insertion and beyond. In the CAT engine, a high-power RF plasma discharge is expanded adiabatically along a magnetic nozzle topology established by permanent magnets. A resultant ambipolar electric field accelerates the ions to high energies to generate thrust while retaining high propellant utilization. The CAT engine offers a means of providing efficient and high thrust-to-power primary propulsion for CubeSats and microsatellites. The CAT engine promises to change the CubeSat paradigm from passive sensor carriers to fully capable mission-completing spacecraft. Successful implementation by our team will result in the transition of technology developed into the commercial sector by a small business, the engagement of the next generation of the space sector workforce, and the infusion of an advanced in-space propulsion technology for future NASA, commercial, and government missions.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Aether Industries, LLC	Lead Organization	Industry	Ann Arbor, Michigan
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California	Michigan
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## Project Transitions

**June 2014:** Project Start**December 2014:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137433>)

## Images



### Briefing Chart

CubeSat Ambipolar Thruster for LEO and Deep Space Missions, Phase I

(<https://techport.nasa.gov/image/134448>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Aether Industries, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Benjamin W Longmier

### Co-Investigator:

Benjamin Longmier

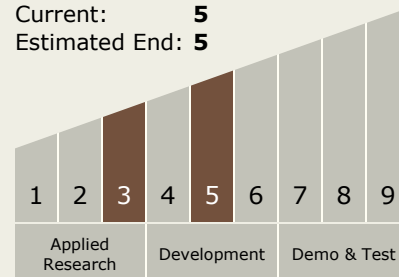
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## Technology Maturity (TRL)

Start: **3**  
Current: **5**  
Estimated End: **5**



## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.2 Electric Space Propulsion
    - └ TX01.2.2 Electrostatic

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System